MINIMUM MEASUREMENT REQUIREMENTS FOR MULTI-BROADCAST SINGLE-FREQUENCY NETWORK MEASUREMENTS

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is related to and claims the benefit and priority of U.S. Provisional Patent Application No. 61/990,993, filed May 9, 2014, the entirety of which is hereby incorporated herein by reference.

BACKGROUND

[0002] Field

[0003] Various communication systems may benefit from well-defined measurement requirements. For example, measurements for multi-broadcast single-frequency networks (MBSFNs) may benefit from definition of minimum measurement requirements related to, for example, reference signal received power (RSRP) and reference signal received quality (RSRQ).

[0004] Description of the Related Art

[0005] Third generation partnership project (3GPP) R1-135918, which is hereby incorporated herein by reference in its entirety, has defined MBSFN measurements. R1-135918 introduces MBSFN RSRP and MBSFN RSRQ as well as MBSFN block error rate (BLER). There are not, however, fully defined minimum requirements for these newly defined MBSFN measurements. For example, requirements related to user equipment (UE) performance when performing such measurements are not defined.

[0006] MBSFN measurements themselves are different from minimum performance requirements for MBSFN measurement. There is no definition of how to map, for example, physical multicast channel (PMCH) decoding requirements to minimum MBSFN measurement requirements in R1-135918. For example, R1-135918 states that the measurement is made only in subframes and on carriers where the UE is decoding PMCH.

SUMMARY

[0007] According to a first embodiment, a method may include obtaining MBMS configuration parameters. The method may also include defining generic minimum MBSFN measurement performance requirements, based on the MBMS configuration parameters.

[0008] In a variant, definition of the generic minimum MBSFN measurement performance requirements may be further based on rules for monitoring the MBMS MCCH.

[0009] In a variant, the definition is based on a change notification repetition period, wherein the change notification repetition period may be equal to a shortest modification period divided by a notification repetition coefficient.

[0010] In a variant, definition of generic minimum MBSFN measurement performance requirements may be split with respect to whether receiving MBMS data or not receiving MBMS data.

[0011] In a variant, when receiving MBMS data, the generic minimum MBSFN measurement performance requirements may be based on a configured MCCH reception period.

[0012] In a variant, when not receiving MBMS data, the generic minimum MBSFN measurement performance requirements may be based on an MCCH change notification repetition period. The change notification repetition period may be equal to a shortest modification period divided by a notification repetition coefficient.

[0013] In a variant, definition of the generic minimum MBSFN measurement performance requirements may include deriving which minimum requirements are to be applied according to discontinuous reception measurement requirements.

[0014] Each of the above variants may be used in combination with one another.

[0015] According to a second embodiment, an apparatus may include at least one processor and at least one memory including computer program code. The at least one memory and the computer program code may be configured to, with the at least one processor, cause the apparatus at least to obtain MBMS configuration parameters. The at least one memory and the computer program code may also be configured to, with the at least one processor, cause the apparatus at least to define generic minimum MBSFN measurement performance requirements, based on the MBMS configuration parameters.

[0016] The second embodiment may include any of the variants of the first embodiment individually or in any combination.

[0017] According to a third embodiment, an apparatus may include means for obtaining MBMS configuration parameters. The method may also include means for defining generic minimum MBSFN measurement performance requirements, based on the MBMS configuration parameters.

[0018] The third embodiment may include any means for carrying out the variants of the first embodiment individually or in any combination.

[0019] According to a fourth embodiment, a non-transitory computer readable medium may be encoded with instructions that, when executed in hardware, perform a process. The process may be the method according to the first embodiment, in any of its variants or combinations thereof.

[0020] According to a fifth embodiment, a computer program product may encode instructions for performing a process. The process may be the method according to the first embodiment, in any of its variants or combinations thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] For proper understanding of the invention, reference should be made to the accompanying drawings, wherein:

[0022] FIG. **1** illustrates modification periods.

[0023] FIG. **2** illustrates parameters in an MBMS-NotificationConfig information element (IE).

[0024] FIG. **3** illustrates an MBSFN-AreaInfoList IE.

[0025] FIG. **4** illustrates a method according to certain embodiments.

[0026] FIG. **5** illustrates a system according to certain embodiments.

DETAILED DESCRIPTION

[0027] The requirements related to multi-broadcast single-frequency network (MBSFN) measurements may need to be done in the same spirit as other measurements performed by